From Annarbour to A2: a morphological genesis of the City of Ann Arbor, USA

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Abstract

This paper presents a historical and morphological analysis of the City of Ann Arbor, USA. The objective of this study is to identify the dynamic process that transforms an idea into a real city that is rich, diverse, and heterogeneous. It discusses the morphological changes that the city has undergone, from its day of foundation in 1824 as a small frontier village to Ann Arbor in 2004, a bustling university town.

1. Introduction

People, individually or in groups, relate to cities. Whatever the form or the complexity, a relationship exists between physical form and socio-cultural activities in an urban environment. This relationship is vital towards understanding city as an idea and as a realization of practice through human construction. The dynamic interaction between urban configuration (form), human behavior (use) and common understanding (culture) continually shapes the growth of a city through time (Habraken, 2000).

This approach is applied to study of the historic evolution of the City of Ann Arbor, the hometown of the University of Michigan. The attempt of this paper is to capture the urban morphological properties that reflect the dynamic interactions in the city from its inception as a frontier town till today. The subject and object of investigation is broad and complex, hence, stress has been rendered on grasping the overall sense of the city, rather than reducing the concept of urban vitality into discussion of one or two aspects of cities or their urban life. The historic morphological analysis of maps from the idealized regular grid plan of 1824 till 2004 with important land-use development and events forms a crucial component of the study. The primary areas of investigation through space syntax theory and methodology are how the city originated, how it grew and why it grew in a particular way. This is followed by a discussion generated by some emerging patterns, but the focus of the study is mainly on the evolution of the city grid and how it has influenced the social-cultural life of Ann Arbor. Another important part of the study is to analyze the relationships between the City and the University of Michigan and what is the extent of influence the university had in the genesis of the city into its present condition.

2. Ann Arbor: the city on the Huron with the University of Michigan

A historic morphologic study is about knowing and telling the history of a city. Telling the history of Ann Arbor requires several stories; of people, of significant events and time-tested conditions, and of an institution - all evolving together. No other city in the state of Michigan, besides Detroit, is so well known or so often visited; no other city, including Detroit, has so completely fulfilled and maintained its identity (Marwil, 1987, p.xii).
If the University of Michigan has exercised the greatest influence over Ann Arbor’s fortune, the history of the city’s development can still be told from its own perspective. The history of the city is not complete without the history of the university; its growth has taken the dimension with the impetus generated by the university. At the same time, Ann Arbor has developed an identity of its own of being a city of trees on the Huron River. There is a dynamic relationship between the city and the university that has been tested, strained and evolved with time and has forged a symbiotic collaboration giving each of them, as well as their relationship, a unique form and image.

A closer look at Ann Arbor’s map shows that it is divided into two by the Huron River, still reinforced by topographic variation and the railway line along the river, a distinction that is more evident in terms of street configuration (Figure 259). In fact, the plan of Ann Arbor shows a complex configuration of regular and irregular grid patterns, occasionally cut across by steady diagonals, the old roads that lead contemporary urbanites towards the neighboring cities and towns and beyond and well bounded by the super-grid of the highways.

This brings us to the important question of the research - how the growth of the city is related to that of the university campus? Examination of this city-campus interrelationship invariably has its focus on the evolution of the urban grid and its syntactic properties. Attempt has been made to study the elements contributing to the strong identity of the city and how these elements are related.

3. Measuring the syntactic properties

The syntactic analysis looks at geometrical and topological properties of the city grid. First, by looking at its degree of regularity, describing the process of morphological transformation of the original regular plan to the highly deformed contemporary grid. The measure of grid axiality\(^1\) represents the degree of regularity of the grid with respect to a perfectly regular rectilinear grid, describing how regular the configuration of the lines is or conversely what is the extent of deformation of the system. Grid axiality for a perfectly regular system is 1, whereas values closer to 0 describe highly deformed grids (Hillier and Hanson, 1984). Second, the interest is to describe the accessibility patterns through time, measured by the global integration values and by the representation of the nucleus of the system, the “integration core” (Hillier, 1989). These are the lines that attract movement associated with configuration of the grid and make the integration core a locus of local and global destinations (Hillier et al, 1993). Thus, the grid configuration is seen in itself as the generator of patterns of movement and the integration core the focus of cities activities dependent on high levels of co-presence and co-awareness. It is of interest the correlation between city’s main activities and grid configuration. The integration core is conventionally formed by the axial lines, which are within the 10% of the most integrated values or 25% when the system is composed of less than 100 lines (Hillier, 1989; Hanson, 1989). The ratio between the mean integration of the core and of the whole system reveals its “strength”. The higher the value, the more efficient the core tends to be in pulling movement and activities towards it. Finally, second order measures are also explored, with particular interest to intelligibility.

\(^1\) The grid axiality could be mathematically calculated as: 
\[ A = \frac{\sqrt{I+2}}{L} \] 
Where, \( A = \) Grid axiality, \( I = \) number of islands, \( L = \) number of axial lines.
Figure 259: Location of Ann Arbor and Map of the City of Ann Arbor, 2004 showing the university campus interspersed within the city
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Figure 260: Values of syntactic properties for Ann Arbor (1824-1948 and 2004)

For the purpose of this research, the highway lines have been considered as the boundary of the urban system, though the city limits go a little beyond them in some locations, but the urban tissue dissolves after this boundary. The results of the analysis are synthesized below:

4. A tale of an evolving trail

In the following section, it has been tried within a short span to define the main lines of development of the city. The timeframes have been selected in the specific order to evoke how and why Ann Arbor has evolved in certain direction and to examine issues and themes that have affected its development. The specific years chosen to describe the morphological evolution of Ann Arbor are favored by access to local records (private collections, memoirs and university archives), as well as by federal and state censuses.

4.1. The most desirable residence in the Great West (1824-1851)

The first image of Ann Arbor is a sketch of a rectangle, in which neatly drawn lots are intersected at right angles by streets. Slanting away from the nearby river is a creek that bends around the western border of the lots. The drawing is a plan registered in Detroit in May of 1824 three months after the land for the village was purchased from the government (Figure 259).

This 1824 map of Ann Arbor is nothing but an idea. It was presented during registration of the land as it was required by a 1821 law that any new town had to “cause a true map or plat thereby to be recorded” before any lots could be offered for sale (Marwil, 1987, p. 2). Ann Arbor was a proposed new frontier town within the newly formed Washtenaw County at the western border of the Michigan Territory (now the State of Michigan). Ann

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2 The historic frames and titles of each section describing the city from 1824-1948 has been taken from the chapters of the book “A history of Ann Arbor” by Jonathan L. Marwil.
Ann Arbor when conceived was imagined to be the county seat, and hence we find “courthouse square”, and “public square” in the conceptualized plan (Figure 260).

The axial map showing the integration core illustrates the symmetry of the regular grid (Figure 261). As a result, the street system has been divided into two groups of integrated and segregated lines. But a frontier community does not grow by its style of architecture or planning of leisure activities. Ann Arbor’s future would depend on its economy. With the benefit of the farming economy base, Ann Arbor was depended on the Huron River. The role of the river was significant in development of saw mills, cooper houses, tanneries, breweries, paper mills, and flour mills. Within twenty years of its development Ann Arbor became a popular place with a strong county seat; steady economy of farming, basic production as well as intellect like lawyers, teachers, bankers and medical practitioners; and desirable infrastructure and facilities like fire protection and mailing services (Marwil, 1987, 3-13).

Ann Arbor was competing with many other new cities of the state for the vied location of the state capital. In the 1836 map of Ann Arbor (Figure 260), we thus find place for state legislative buildings, prison houses, and larger public squares. Though Ann Arbor failed to be the state capital, it was successful in coaxing the University of Michigan, then known as the Michigan State University to move permanently from Detroit into the two blocks east of South State Street that was originally allotted for state capital buildings (Figure 260).

In the 1836 integration core map, we can find that part of the 1824 core is part of the “real city” core (Figure 261). The interesting development in this map is the high integration value of some of the horizontal lines around the blocks allocated for state capital buildings and later for the University of Michigan. It was a slight shift, expansion in a real sense, of the core of the planned city towards the new activity area that is the South State Street area (Figure 260, 261). Perhaps, this was the first indication of the potential of the future university location as a generator of activities and attracting movement and actions around it. It was time that the dynamic relationship between the community and the university was about to sprout.

4.2. A new Athens (1851-1878)

The 1853 map of Ann Arbor shows a settlement that is understandably still concentrated within the original 1824 plat, but we can already see a wide scattering of structures east of Division St and around the much larger university campus (Figure 260). It was a time when the university community, now a robust 35% population of the city, was the prime structural and economic generator of the city (Marwil, 1987, p.28).

The axial map showing its integration core depict the 1824 and 1836 core still constituting the highly integrated lines along with strong expansion of the core towards south parallel to the State Street (Figure 261). The intricate pedestrian network of the university campus, known as the “Diag”, appears for the first time. The increase in connections in State Street makes it one of the most integrated lines in the system along with the North and South University Roads. The connection of Broadway into the Lower Town and some

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3 The Diagonal, or Diag, comprehends the central courtyard around which the first university buildings were constructed. Today, though the campus has grown in multiple directions, this court or quad forms an important pedestrian connection that helps diagonally crossing the university campus. Historically and morphologically, the Diag has become an important component of the city fabric too as a place of passing by and congregation for students, tourists, as well as the city population.
Figure 261: Axial maps of Ann Arbor, 1824-1948 showing evolution of the integration core
grid layout around it indicates the neglected side of the Huron, which is contrasting to the lively core (Figure 260).

The high pitch of development of the last fifty years was hit hard with panic of economic depression in the 1870’s. Development projects like the railroad and constructions in the Lower Town were stalled, delayed, or never realized (Duff, 1962; Marwil, 1987). Ann Arbor started to become less and less of a significant industrial and commercial center with exodus of major industries from the city. The recession period in the history of Ann Arbor could be traced in the map of 1874 (Figure 263). There is not much shift or expansion in the integration core. The interesting fact is that in spite of debasement of population and activities, the city is able to maintain the old core and restrict any negative impact. One major reason could definitely be the University that helped in maintaining the equilibrium of the community through activities like land banking and other generative works. The university adopted residential policy and allowed the city of Ann Arbor residents to rent their homes to students and faculty. This could be an indication how the University influenced the development of the city by balancing the negative impact of the economy by its positive economy generating activities.

4.3. City of knowledge and homes (1878-1914) comprehend

If examined closely, the 1880 panoramic view of Ann Arbor (Figure 262) will be seen to have individuals walking all in one place - the grounds of the university. At this point of time the university was prime driver of the economy of Ann Arbor, explaining the concentration of people around it. The view is a wonderful picture to understand the changes
occurring in the landscape. Large open spaces suggest still a place of rural activities and pastoral vision. Yet, it is the expansion of the human construction that grasps the attention, signifying Ann Arbor shown in the 1908 map, as a thickly built community (Figure 260) with a large portion of university students (Marwil, 1987, p.55).

The 1908 axial map showing the integration core is interesting as it still maintains the configuration of the earlier cores and its strength (Figure 261). With development restricted to residential development, short segregated lines with fewer connections appear in the system, decreasing the mean integration, thus resulting in strengthening the core. The deep structure of the system thus makes the integration core a strong attractor of activities and movement. The major development is related to the expansion of the university mainly towards the south for the sports fields and to the north-east for new medical facilities (Figure 260). The north-south orientation of the university and east-west expansion of homes defined the shape and configuration of Ann Arbor. At this point, the basic structure of the city is in place and is full of potential for future infill and densification.

4.4. The city where commerce and education meet (1914-1945)

This was the time that saw two world wars and Ann Arbor was one of the thousands of American communities that reaped large benefits from the war. Years during the World War I (1915-16) saw tremendous growth of small business and local manufacturing industry. Though it grew to remain a university town with bludgeoning student population, the industrial base attracted large amount of labor force, especially German and Greek immigrants (Duff, 1962; Stephenson, 1927). More students and more people meant need of more and more houses and that could be seen in this map of 1925 (Figure 260). The city expanded along south east and west, the two directions left open for growth after the expansion of the university. Growth of new houses was along some of the most integrated lines where expansion was possible like Washtenaw and Packard towards south-east and State towards south (Figure 260). These most integrated lines of expansion were also the main roads connecting Ann Arbor to the surrounding towns. Even today, after the ring of highways that surround Ann Arbor (Figure 262) these are still the primary access roads of the town to and from these highways.

Second World War followed and so did automobile at its footstep. Ann Arbor was conceived as a safe town both for automobiles and pedestrian movement (Marwil, 1987). Though Ann Arbor underwent major changes during this time, it was not reflected in its expansion. But, it was the post second world war period that would see what expansion could be.

4.5. Research center of the Midwest (1945-1980)

Apart from the changing face of the university that was at its peak and saturated in size within the confines of the city, Ann Arbor had changed little in the last fifty years. The impetus that created the promise of transforming it into a vigorous commercial and industrial center was gone with the war and the university became the pivot for the city's economy and identity (Marwil, 1987). The huge population of the university was constricted to the old boundaries and there was a growing need for building expansion in the form of a new campus. The growing university coupled with growing population after the World War II resulted in large amount of new single family and multi-family housing
Figure 263: Axial maps of Ann Arbor, 1824-1948 showing the changes in global integration signifying the relative accessibility of any point in the city.
construction. All these resulted in doubling of size by Ann Arbor in the fifteen years that followed the war (Figure 260).

The university was at its peak and a symbiotic relationship developed between the university and the city through the years (Marwil, 1987). The university acted as a prime attracting force for commercial and business organizations for new research and development that in turn helped the city to benefit from those organizations. This was the time when the identity of the city was primarily associated with that of the university though the landscape, the river, and activities like art festival and state fair helped Ann Arbor to carve a niche of its own.

Looking into the axial maps, it is clear how the expansion of the city was taking place and in which directions (Figure 261). The integration core was expanding maintaining its original historic core and reaching out towards west, south-east and south through highly integrated lines (Figure 261). The system was becoming deeper with short axial lines forming highly segregated and remote areas, part of the housing developments (Figure 262). And finally after a century and a half, the City of Ann Arbor moved into the other side of the river that was once called the Lower Town (Figure 260). This time too, like the convention now almost established, the university was the catalyst, by building its north campus. This development attracted student housing and hence retails and commerce surrounding it. This generated movement and action around the area attracting light industry and more commercial and residential development. But, the development on this side was and still is disconnected from the urban center, mainly because of the strong natural as well as human barriers. (Stephenson, 1927; Marwil, 1987) The university central campus is along the highly integrated lines of State Street, North University and South University streets. The expansion of the medical campus just north-east of the original campus is also along high integrated lines of Huron, Catherine, Ann and Ingalls. Nevertheless, the old historic core continuing commercial, residential and other mixed-use activities, like farmer’s market, bus depot and train station, still keep the old core vibrant and relevant to the city’s development.


Car and highways epitomize the evolution of present urban form in North America. Ann Arbor was no exception. The national highway network was already in place. It encouraged mobility. Federal governmental policies, private interests and incentives for individual mobility and social construction of the great American dream kicked in rapid disinvestment in cities, deindustrialization and suburbanization in the American metropolis. Downtown departmental stores were closing in Ann Arbor and shopping malls were constructed in the outskirt of the city along the highways. Today, Ann Arbor is bounded by a highway ring facilitating access from the fringe areas of the city.

The highways had immense impact on the morphology of the city edge. If the highly integrated lines channeled the driving force of population and activities into the outer areas from the core through a process of extension, the highway ring facilitated a development process that consolidated the open areas in the fringe of the city through development of housing complexes, big box stores and malls in the outer ring (Figure 259).

In spite of all these forces of dispersion from the downtown and debasement of the

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4 The axial maps have been constructed by the authors using AutoCAD and the syntactic analysis have been processed by the authors using Mindwalk @Lucas Figueiredo.
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5. The process of extension, deformation and consolidation of the grid

Ann Arbor's urban development is an example of a typical phenomenon that occurs in cities that evolved from a regular grid to assume a certain degree of deformation, mostly at their fringes. The development process described in the previous sections can be summarized in four phases. The first phase comprehends the "creation of the settlement", as seen at the 1824 map, and is characterized by a fairly regular grid, with orthogonal intersecting angles and formed by a set of equally sized lines. Because of the regularity of the grid, the accessibility (mean integration) of the system is high, but the differentiation is low. The predominance of the orthogonal grid does not indicate that there are not irregularities, such as interruptions of the grid (making lines longer than others, therefore with higher connectivity values), differences in block size, small scale subdivision of existing urban blocks, or recursively, aggregation of blocks, and incorporation of pre-existing roads forming crossways through the grid.

The second corresponds to the "extension of the grid", covering the period represented by the 1836 map. The city limits are expanded by natural extension of the existing streets and construction of new blocks following the principle of the orthogonal grid. It also becomes denser with the subdivision of some urban blocks by service lanes. Some irregularities found previously are also present, but the original grid is still the model for city's development. The right angle is predominant, but the diagonal arteries that spread out from the town seem to indicate the imminent deformation of the grid. The complexity of the system increases, both geometrically (higher diversity of line size and angles of incidence) and topologically.

The "deformation of the grid", the next phase, starts to determine the form of cities expansion towards the periphery after 1853 and could still be seen in the 1948 map. The expansion occurs through non-regular developments or by offsetting the grid. In other words, the deformation by grid interruption is substituted by the process of developments addition that follows independent composing rules. The extension of existing lines is substituted by the addition of small, double connected and non-orthogonal lines. In this process, the role of the crossways and sinuous paths in directing the suburban developing promoters is evident, as well as in reinforcing the accessibility to the Downtown area, keeping its high degree of centrality.

The last phase of "consolidation" (1948-2004) extends the process of grid deformation by small scale non-orthogonal new developments that fulfilled and, perhaps, will continuously fill in the existing open spaces left intact within the urban fabric. This is the kind of process that has been developing at the north side of the Huron, promoted by the University of Michigan and private developers. The integration core is extended towards city's boundaries, but the strategic position of the old core is consolidated, as an effect of driving forces of urban growth in the downtown, the city maintained a strong integration core (Figure ??). The highly integrated lines (State, Main, Jackson, Washtenaw, and Plymouth) that helped in extension, now acted as powerful connection between the city core and the high speed highways, making downtown easily accessible from its outskirts. In Ann Arbor, the downtown seems to have survived because of this subtle combination of high accessibility, powerful connection and the catalytic power of the university right there. The university is, indeed, a fundamental attractor and the facilities and the leisure activities that gravitate around it still making the center an area of interest.
the construction of a ring of highways that surrounds the denser urban area and its connections to the Downtown (Figure ??). This super-grid forms the set of highly integrated lines that facilitates movement to and through the city.

These phases of grid deformation are portrayed by the changes of the grid axiality values (Figure 264). The plan of the proposed settlement was fairly regular (0.944), but with the extension phase, the value is reduced at an order of 26.46% of the original plan. At the end of the deformation phase, the grid axiality had dropped to 0.138, corresponding to a decrease of 85.36% of the original value. The consolidation process presents even lower values.

The process of extension, deformation and consolidation is similar to those described by Major (1997, 1999) when examining large scale North American cities, in particular the case of New Haven. According to the author, the original regular settlement expanded progressively, first, through the extension of few existent streets and, second, through the deformation of the grid with the incorporation of new “non-regular” developments at its periphery. The effect of this twofold development was to favor the global accessibility of the original settlement, which was, in turn, further reinforced by a block subdivision process that occurred at its core, probably to attend to the demands of property market to offer new addresses at such prestigious area.

The process of morphological evolution in Ann Arbor seems to portray a typical historical process of formation of a kind of North American city. Ann Arbor’s original settlement was indeed favored by this particular process as it took part of the integration core of the city in every stage of its growth and it was always easily accessible from the city’s boundaries through highly integrated lines, making downtown Ann Arbor an attractive location for entertainment, public services, and retail. In fact, the strength of the core was kept relatively stable through time and at high levels, even with the significant decrease of the mean integration of the system and that of the core itself in recent periods (Figure 264).

This form of expansion of the regular grid is not common. Other North American cities originated from regular grids grew predominantly through the extension of the grid lines in all directions as, for example, in Chicago (Major, 1997). This form of expansion not necessarily favors the historical centre, as natural barriers - river, shore line or mountains, may block the symmetrical development of the grid, therefore generating other centralities. On the other hand, cities that have emerged from multiple aggregations of city blocks to form highly deformed grids can also expand by gradually moving its configurational core, with deadly consequences to its historical centre. Recife, a Brazilian coastal city founded in the XVI century, and highly dependent on its harbor and commercial activities, progressively lost the centrality of its historical centre while expanding towards inland (Loureiro and Amorim, 2000). This process moved downtown to a peripheral location, therefore losing its attraction as a good location for city’s business and main retail district.

The effect on the vitality of its historical center is evident, as the core strongly maintains its integrity through continued activities through various designed programs like heritage programs and bringing in historic events, like the art festival and farmers’ market, within its confines, but it has also expanded primarily guided by the development and expansion of the university campus. The development of the University of Michigan is strongly tied with the development of the city. Throughout its history the university campus has been the developer guiding and influencing city expansion. Attracting activities and generating movement in new areas through new constructions and also through strategies like land banking; the university campus has influenced the configuration of the city.
Figure 264: Axial maps of Ann Arbor in the year 2004: (a) global integration illustrating the extension, deformation and consolidation processes; (b) integration core)
Figure 265: Graphs showing a. the relationship between grid axiality and intelligibility in the city, and b. the strength of the core of the city through 1824-2004.

6. Conclusion

The Ann Arbor we find today is a result of several evolving processes. Throughout the years different forces have influenced the growth of the city and its morphology. The processes of extension, deformation, and consolidation reflected in the evolution of the urban form inform us about the history and geography of the place. Understanding this dynamic give us a sense of the city. It is necessarily complex, but its complexity is far from being disordered. There is an order within the disorderliness, regularity in midst of evolving irregularity that could be identified with and in Ann Arbor. From the chronological understanding and syntactic analysis, we find a unique city, whose flavor is derived from the juxtaposition of urban morphology and appropriating activities of the university.

Literature


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